International Civil Aviation Organization

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST SEMINAR AND FOURTEENTH MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/14)

Christchurch, New Zealand, 14 – 17 April 2015

Agenda Item 4: Review States' activities and interregional issues on implementation of ADS-B and multilateration

AUSTRALIAN REPORTING & ANALYSIS OF ADS-B ANOMALIES

(Presented by Australia)

SUMMARY

This paper details the mechanism employed by Australia in the reporting and analysis of ADS-B anomalies

1. Introduction

This paper details how ADS-B avionics problems are detected and processed in Australia.

2. ADS-B problem detection

2.1 Detection by ATC

ATC detect ADS-B avionics problems when the controller notices an abnormal ADS-B data (incorrect or missing data). Typically this is a mismatch between ATC expectation and surveillance data. The ATC expectation can be due to:

- Flight plan information (route, Field 10 indicators)
- Flight co-ordination with adjacent sector, FIR or unit
- Mismatch with route, flight level, flight identity

The mismatch may occur pre-flight, during taxi or in flight

The ATC may be assisted by ATC automation to detect anomalies

- Route adherence monitoring
- Cleared level adherence monitoring
- Missed position report monitoring
- Indication of missing ADS-B data (before leaving radar coverage)
- Alerting when identity mismatch occurs (eg: Flight ID vs Flightplan)

ATC procedures (reproduced below) require that the pilot be asked to changeover transponders when an issue is identified, because this can rectify most "faults".

9.6.9 Transponder error reporting - Mode A/C/S and ADS-B

9.6.9.1 ATC actions

If an expected surveillance track is not displayed, unexpectedly dropped or displayed in an incorrect position:

a) advise the flight crew and instruct that they recycle the transponder and/or select secondary transponder as appropriate

b) further advise the flight crew of the result of any transponder change, and request that the issue be checked post-flight

c) record details for reporting including, in the case of SSR Mode A/C errors, the transponder type

d) if ADS-B, and the issue remains unresolved, instruct the pilot to contact the National Operations Centre by telephone after arrival (phone 02 6268 5662).

Note: Point d. above will potentially trigger ADS-B 'blacklisting'. The total absence of ADS-B data (when otherwise expected), does not warrant blacklist consideration, but should be reported via CIRRIS.

2.2 Detection by technical monitoring

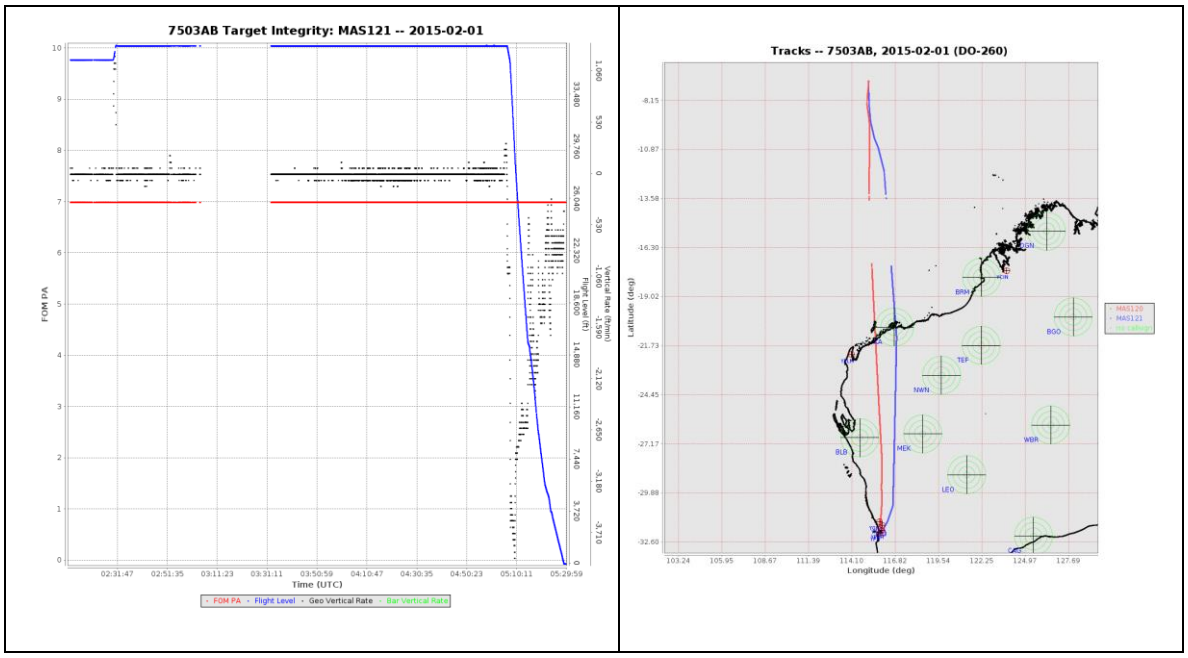
Each week, statistics are automatically extracted and emailed containing a list of airframes detected in the previous week. This includes:

- 24 bit code
- Associated Flight IDs used
- Min & Max FOM (NUC/NIC)
- Number of position "jumps"
- Number of zero integrity reports
- Registered operator & aircraft type (For Australian aircraft)
- ADS-B data version

Each week a manual examination of the data from each "not previously detected" aircraft is conducted.

The list of "new" aircraft, and aircraft still assessed as a problem

a) Is entered into a database, and categorized.
b) Is entered into an "extraction system" which generates a graphical printout of key parameters verses time as shown below.



Such a printouts make it easy to identify anomalous behavior. Key parameters that can be examined include:

- Integrity (FOM/PA, NIC, NUC) versus time (eg per day)
- Reported level, vertical rate versus time
- List all reported Flight ID (quick identification of bad Flight ID)
- Percentage of zero integrity reports
- Plan view plot of all reports from one airframe in a day

c) Has any deficiency categorised (and hence identifying any "new" deficiency types).
d) Has the operator , aircraft type, country of registry identified and entered
e) Has the data examined for :

- track consistency (lack of jumps, holes etc)
- valid Flight ID
- FOM (NUC/NIC) values
- Presence of geometric altitude (indicates GPS equipage)
- Presence and correctness of velocity vector
- Correctness of 24 bit code (mainly correct code block)

This database is then used to manage investigations with OEM, Avionics vendors, the regulator. It is also used to report on fitment rates and other related statistics. Weekly and monthly reports are published by email within the ANSP organisation including lists of non equipped airframe registrations.

3. ADS-B problem reporting

CIRRIS

ATC identified events are entered into a database system (CIRRIS) that captures all safety related events organizational wide. CIRRIS reports are provided to a wide range of Airservices specialists and to the regulator CASA. CIRRIS reports may be the result of human error, procedural errors, pilot errors, flight planning errors or ATC errors. Some CIRRIS reports may identify potential ADS-B avionics errors. In such cases, the Technical staff investigate further and an ASID database entry may be created.

ASID

Airservices Australia maintains a corporate wide database (ASID) that records and tracks deficiencies with the Air Traffic Management systems. It is used for example to record all identified software errors in the ADS-B ground stations, radars, and in the ATC automation system.

A new category of issue called "Surveillance Avionics" has been created within the ASID database so that avionics problems can be captured, managed and reported. The ADS-B Avionics performance tools provide support for those identifying and characterising avionics errors (both design errors and faults).

4. Co-ordination and resolution

Typically, a reported ADS-B avionics deficiency triggers and examination of the recorded data and co-ordination with the Airline, aircraft OEM (Boeing, Airbus, Embrarer etc) and possibly the avionics vendors (Honeywell, Rockwell, ACSS, Garmin etc). The objective is to identify the root cause of the issue.

Depending on the nature of the problem, additional data capture may be required. Meetings, teleconferences and other activity may be necessary to assist the parties find a solution.

Typically a solution will take in excess of 12 months to correct because most avionics deficiencies are design related (eg software).

5. Potential Blacklist

During the period before resolution, depending on the nature of the issue, the aircraft using this avionics type may be "blacklisted" and not displayed to ATC.

The blacklist procedure allows a short time (2 days) for the aircraft operator to either correct the defect, or to inhibit ADS-B transmissions (eg by setting NUC/NAC/SIL to zero). If the blacklisting proceeds, the identify of the aircraft (ICAO Aircraft Address) is distributed to each ADS-B receiver and results in a capping of the FOM to 2 – preventing the data from displaying to ATC.

6. Action by the meeting

6.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matters as appropriate.

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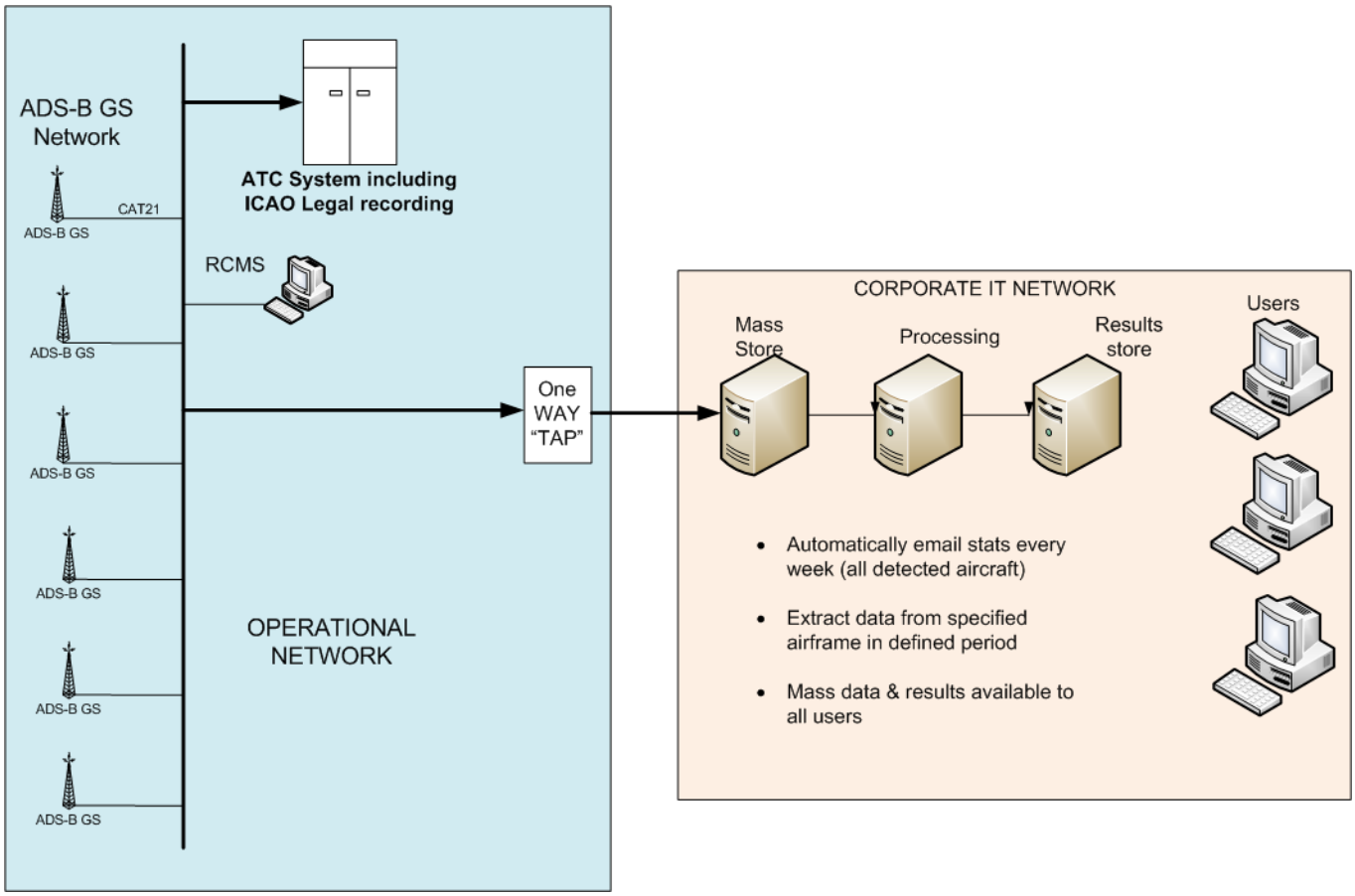
Appendix A : ADS-B Data Collection and Statistics reporting

Airservices has developed tools to automatically capture all ADS-B data from ADS-B ground stations into the Corporate IT network, using a "TAP" to isolate it from the Operational network. In addition, tools allow users on the Corporate network to receive regular emails containing details of all aircraft received in the previous week, and to allow users to extract all data related to selected airframes, for individual analysis as required.

While routine recording is of the Asterix Cat 21 data, where required for specific problem solving, the DF17 downlinked messages from the aircraft can also be recorded and analysed.



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